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Wicklow County Council

Baseline Emissions Inventory -Tier 2 Assessment

Final Report
May 2023

Comhairle Contae Chill Mhantáin
Wicklow County Council

KPMG Sustainable Futures

KPMG Future Analytics

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Executive Summary

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Executive Summary: Overview

The baseline emissions inventory (BEI) is a key instrument that enables local authorities to measure the impact of planned actions relating to emission reductions across their own operations, as well as relevant sectors of society. The BEI represents an evidence-based approach to not only inform appropriate emission reduction actions but also measure progress overtime.

Wicklow County Council's BEI is informed by the guidance document **'Technical Annex C: Climate Mitigation Assessment'**, ensuring a robust and consistent approach across all local authorities in the development of their BEIs. As per this guidance document, there are three approaches to the development of a BEI – *Tier 1, Tier 2 and Tier 3* – each of which allow for local authorities at varying levels of experience and maturity to produce a BEI.

Wicklow County Council's have adopted both a **Tier 1** and **Tier 2** approach, as summarised below.

2018 is used as the baseline year for this BEI assessment. This year has been purposefully chosen to align with Ireland's national targets which are set against a 2018 baseline year.

The results of the **Tier 1** and **Tier 2** are summarised on the following pages.

01

Tier 1 'Top-down' Assessment

- The Tier 1 approach is the simplest and quickest approach to estimate carbon emissions at a County Council level.
- This approach is informed by publicly available data, predominantly the Environmental Protection Agency's (EPA) MapEIre database.

Tier 2 'Bottom-up' Assessment

- The Tier 2 approach allows for a more detailed look at drivers and hotspots of carbon emissions through the use of more detailed datasets.
- This approach is informed predominantly by publicly available data, including the Central Statistics Office (CSO), Transport Omnibus and the Environmental Protection Agency (EPA).

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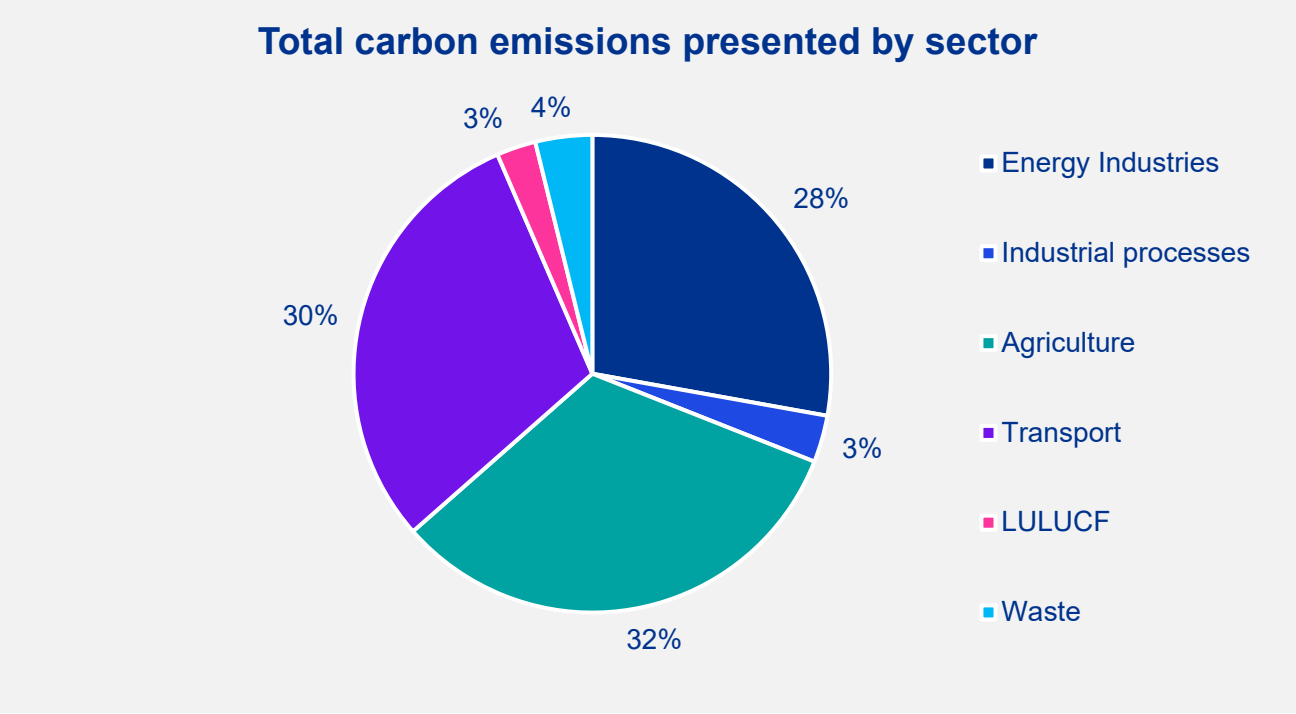
Executive Summary: Tier 1 assessment results

The EPA's MapEIre database has been used to inform the Tier 1, 'Top-Down' assessment of carbon emissions within the Wicklow County Council boundary area.

Total baseline carbon emissions across the Wicklow County Council boundary area equates to: **1,101,000 tCO_2e**.



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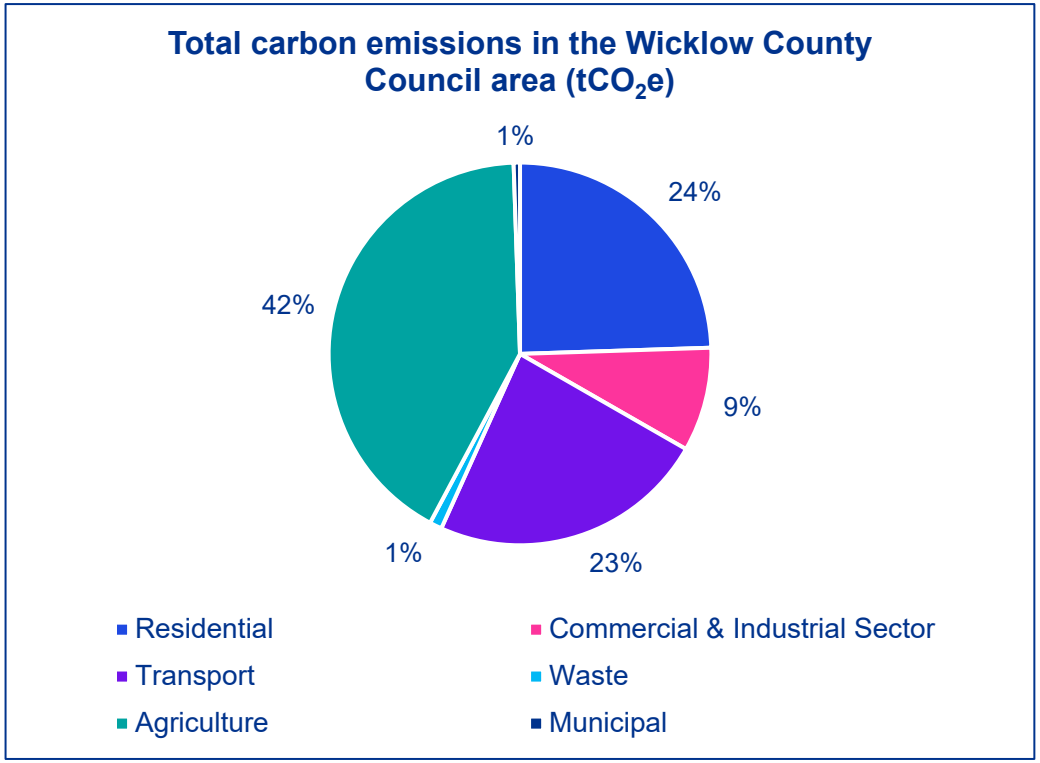
Executive Summary: Tier 2 assessment results

Total carbon emissions equate to approximately **1,275,091 tCO_2e**.

	Carbon emissions (tCO_2e)
Residential	312,201
Commercial & Industrial Sector	112,246
Transport	299,115
Waste	13,308
Agriculture	531,399
Municipal	6,822
Total carbon emissions	**1,275,091**

Total carbon emissions per capita (tCO_2e/capita)	**8.95**



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02
Introduction

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1.1 Global & National Response to Climate Change

Global responses to climate change are accelerating as exemplified by the signing of the COP21 Paris Agreement by 195 countries in 2015. Ireland's climate policies are evolving in line with national and international requirements and aims to "pursue and achieve, by no later than the end of 2050, the transition to a climate resilient, biodiversity rich, environmentally sustainable and climate neutral economy."

Climate change has become one of the most pressing global public policy challenges facing governments today.

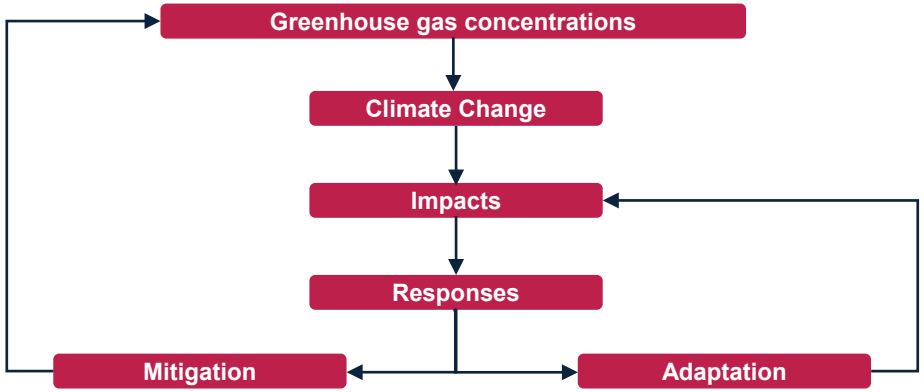
International organisations, national and local governments are increasingly compelled to take ambitious action through mitigation (decreasing emissions that cause climate change) and adaptation (enhancing resilience to climate change impacts and risks).

Ireland's Local Authorities are developing Local Authority Climate Action Plans (LACAPs) to play their part in meeting national emissions objectives and to transition to a climate resilient, biodiversity rich, environmentally sustainable and climate neutral economy. These plans need to be underpinned by a robust evidence base detailing sources of emissions as well as the current and future climate-related risks faced by the Local Authority.

In response to the challenges posed by climate change, two complementary approaches are being adopted.

Mitigation: ensuring the impacts of climate change are less severe by preventing or reducing carbon emissions. Mitigation is achieved either by reducing the sources of these gases (e.g. by increasing the share of renewable energies, or establishing a cleaner mobility system), or by enhancing the storage of these gases (e.g. by increasing the size of forests).

Adaptation: anticipating the adverse effects of climate change and taking appropriate action to prevent or minimise the damage they can cause, or taking advantage of opportunities that may arise. Examples of adaptation measures include large-scale infrastructure changes, such as building defences to protect against sea-level rise, as well as behavioural shifts, such as individuals reducing their food waste.



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1.2 Ireland's Response to Climate Change

Paris Agreement, 2015

The Paris Agreement, adopted in 2015 provides an internationally accepted and legally binding global framework to addressing climate change challenges. It has two clearly defined goals aimed at supporting progressive and ambitious climate action to avoid dangerous climate change:

I. holding global average temperature increase to well below 2°C and pursuing efforts to limit the temperature increase to 1.5°C above pre-industrial levels (i.e. **mitigation**);

II. increasing the ability to adapt to the adverse impacts of climate change and foster climate resilience (i.e. **adaptation**).

European Climate Law, 2021

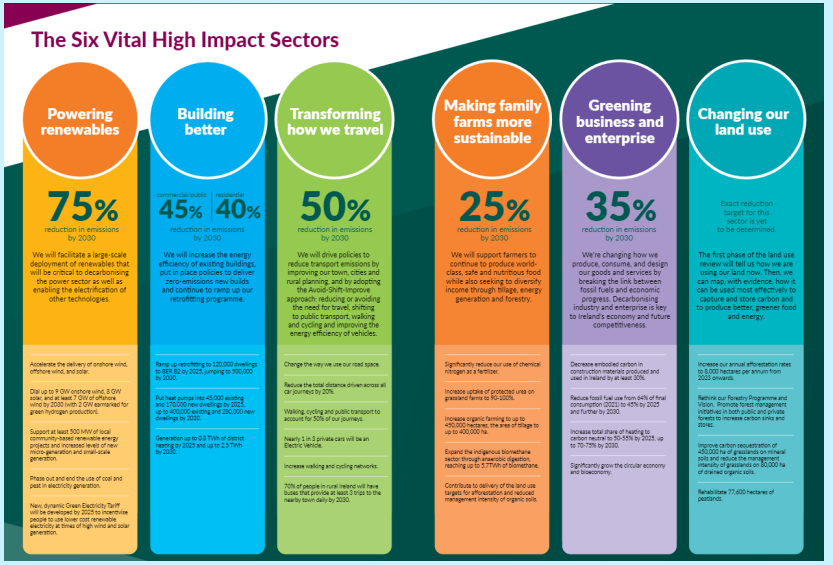
The EU adopted a legislative proposal for the European Climate Law in June 2021 to frame the climate neutrality objective by 2050 across the EU with an intermediate target of **reducing net greenhouse gas emissions by at least 55% by 2030**. The European Commission (EC) is clear in the commitment required by all Member States, and the use of all policy levers and instruments, to fight against the urgent challenge of climate change and to activate leadership efforts to reach climate neutrality by 2050.

Climate Action and Low Carbon Development (Amendment) Act, 2021

Climate policy in Ireland reflects the ambition of the EU and that required to confront the challenges of climate change. The Climate Action and Low Carbon Development (Amendment) Act, 2021 frames Ireland's legally binding climate ambition to delivering a **reduction in greenhouse gas emissions of 51% by 2030**, to achieve climate neutrality by the end of 2050.

Through progressive economy-wide carbon budgets, sectoral ceilings, a suite of strategies devised to promote a **combination of adaptation and mitigation measures**, and robust oversight and reporting arrangements, climate policy is working to scale up efforts across all of society and deliver a step change on ambitious and transformative climate action to 2030 and beyond to 2050.

Climate Action Plan 2023



Regional & Local Policies:

- Regional Spatial and Economic Strategy 2019 – 2031- Eastern and Midlands Regional Assembly
- Wicklow County Development Plan 2022 – 2028

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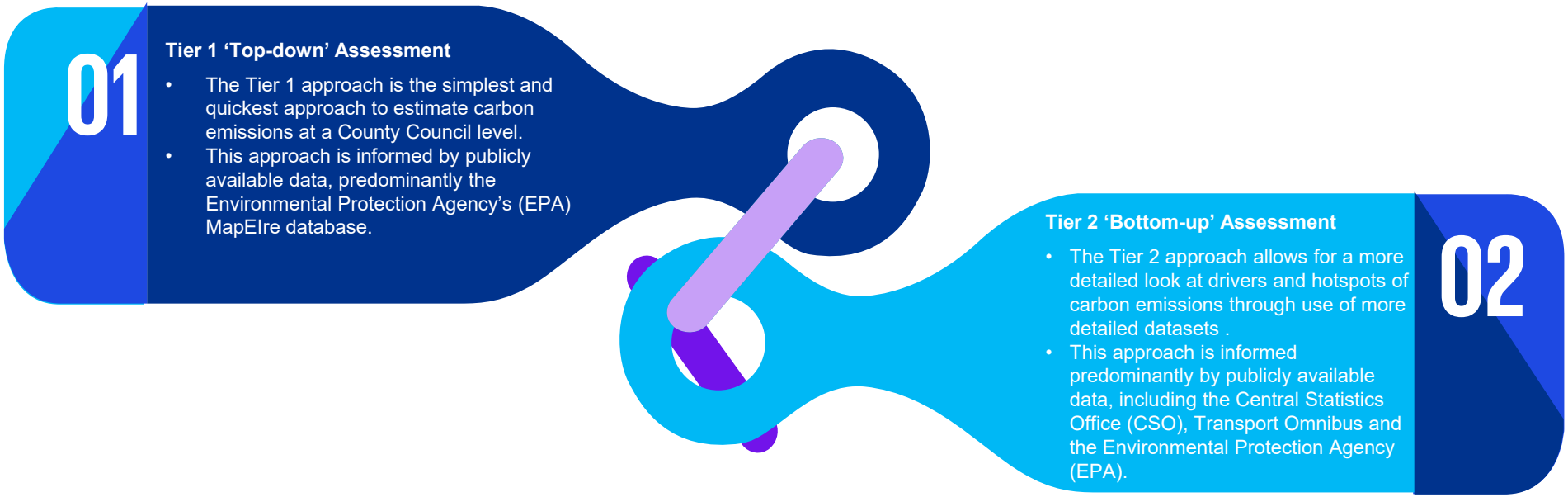
1.3 Establishment of the Baseline Emissions Inventory

The baseline emissions inventory (BEI) is a key instrument that enables local authorities to measure the impact of planned actions related to emission reductions across its own operations as well as relevant sectors of society. The BEI represents an evidence-based approach to not only inform appropriate emission reduction actions but also measure progress overtime.

Wicklow County Council's BEI is informed by the guidance document **'Technical Annex C: Climate Mitigation Assessment'**, ensuring a robust and consistent approach across all local authorities to the development of their BEIs. As per this guidance document, there are 3 approaches to the development of a BEI – Tier 1, Tier 2 and Tier 3 – each of which allow for local authorities at varying levels of experience and maturity to produce a BEI. Wicklow County Council's have adopted both **Tier 1** and **Tier 2** approach, as summarised below.

2018 is used as the baseline year for the BEI assessment. This year has been purposefully chosen to align with Ireland's national targets which are set against a 2018 baseline year. This BEI assessment provides a snapshot in time of the carbon emissions across all identified sectors of the economy within the boundaries of a specific local authority. The baseline covers both direct and indirect emission sources within the administrative area, as well as the level of control and influence a local authority has over these emissions.



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1.4 Characteristics of Wicklow County Council

Wicklow County Council

Geographically the county is dominated by the Wicklow Mountains. It has the largest mountain area and the largest national park in Ireland. Wicklow's unique landscape includes the Sally Gap, Powerscourt, the Bray to Greystones Cliff Walk and the early monastic site of Glendalough, which makes it a popular tourist and recreational user destination.

As of the 2022 Census, County Wicklow has a population of 155,485 people (2016: 142,425), which represents an increase of 13,060 (9.2%) since 2016. The county has experienced relatively steady population growth over recent years and has an almost exactly equal gender breakdown (2016).
CSO data shows that between 1991 and 2011, the largest change in population occurred in the 45 to 64 age group, with an increase of 3% in this age cohort. This will have significant impact on the County's development over the coming years with regard to health care services demand,

dependency and housing with the largest concentration along the N11 corridor coastal zone.

Approximately 36,800 of the County's population live in rural areas (areas outside of the designated county towns and villages), and while the proportion living in rural areas has declined, County Wicklow's rural population has experienced an increase in population between 2006 and 2011.

Wicklow is predominantly an urban county and the council has 5 municipal districts: these include the Municipal Districts of Arklow, Baltinglass, Bray, Greystones and Wicklow. County Wicklow's geographical proximity to County Dublin and its location within the Greater Dublin Area are of key contextual importance in the future development of the County.

Wicklow is predominantly an urban county and the council has 5 municipal districts: these include the Municipal Districts of Arklow, Baltinglass, Bray, Greystones and Wicklow.

County Wicklow's geographical proximity to County Dublin and its location within the Greater Dublin Area are of key contextual importance in the future development of the County.

The principal towns of Arklow, Bray, Wicklow, and Greystones are located on the east coast, with Blessington located on the west, while smaller and more rural settlements are located in the centre and west. The extent of commuting has increased significantly, with increased population growth, particularly in the settlements in the north.
In terms of infrastructure, the main national roads from/to Wicklow are the M11/N11 on the east and the N81 on the west. The county is accessible to and from Dublin by the Dublin to Rosslare railway, Greystones and Bray are serviced by the DART, and Blessington is served by Dublin Bus. The Rosslare Europort provides access to the UK and mainland Europe with over 30 sailings per week.

Tourism and recreation make a positive contribution to the economic and social wellbeing of County Wicklow. In 2017, 275,000 overseas tourists visited the County generating revenue of €73m with a further 319,000 domestic visitors generating an estimated €49m in revenue.

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BEI Assessment

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3.1 Tier 1 'Top-down' Assessment

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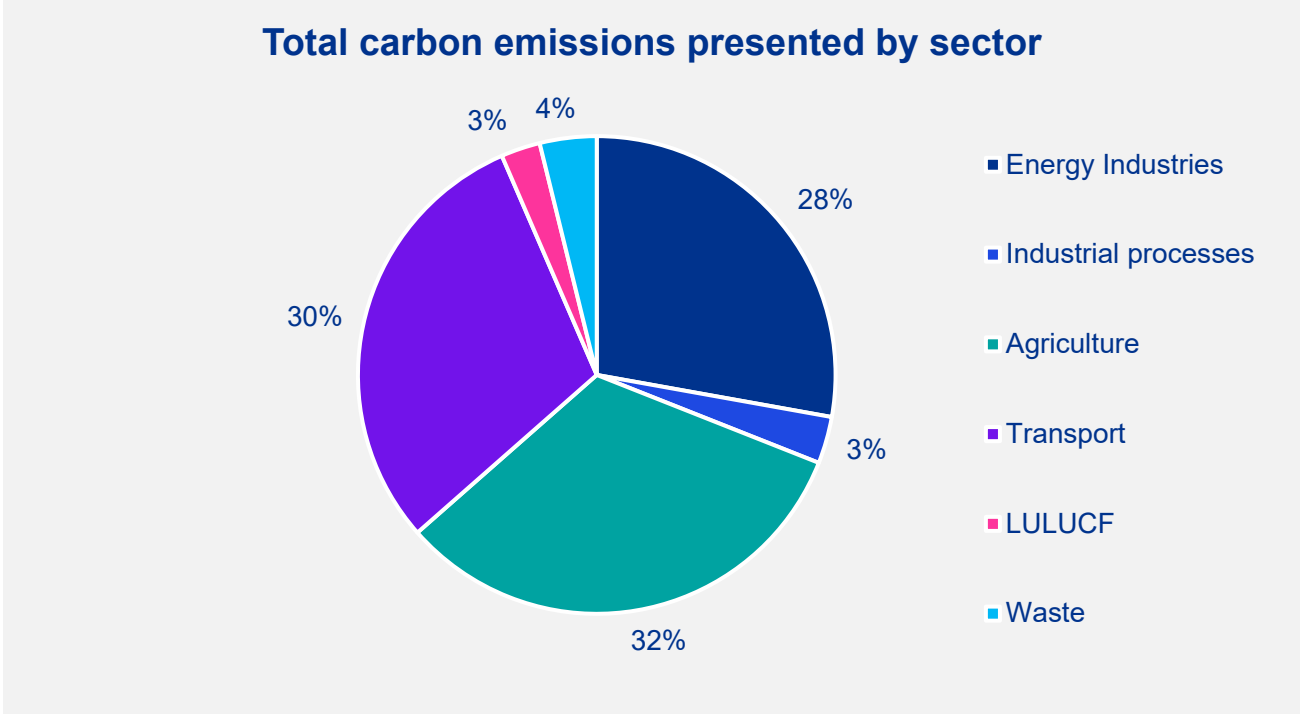
3.1.1 Tier 1 'Top-Down' Assessment: Results (1/4)

The EPA's MapEIre database has been used to inform the Tier 1, 'Top-Down' assessment of carbon emissions within the Wicklow County Council boundary area. The results of the Tier 1 'Top-down' assessment is illustrated on the chart below with carbon emissions reported as carbon dioxide equivalent (CO_2e) – this unit allows for the impact of greenhouse gases (GHG) to be reported as one number. Total baseline carbon emissions across the Wicklow County Council boundary area equates to: **1,101 kilotonnes CO_2e**.

As illustrated, the main sources of emissions within the Wicklow County Council boundary area are agriculture, transport and energy industries, accounting for 32%, 30% and 28% of total carbon emissions, respectively. Waste, Land Use, Land Use Change and Forestry (LULUCF) and Industrial processes account for the remaining 10% of total carbon emissions.



Note that the MapEIre database does not include analysis of the residential and commercial and public sector. The majority of emissions associated with Energy Industries are associated with electricity generation rather than consumption of energy.

On the following pages, visual representations of transport and agriculture are shown for the purposes of communication. These visual representations are drawn from the MapEIre database.

A further breakdown of carbon emissions is included in the **Appendix** of this report.

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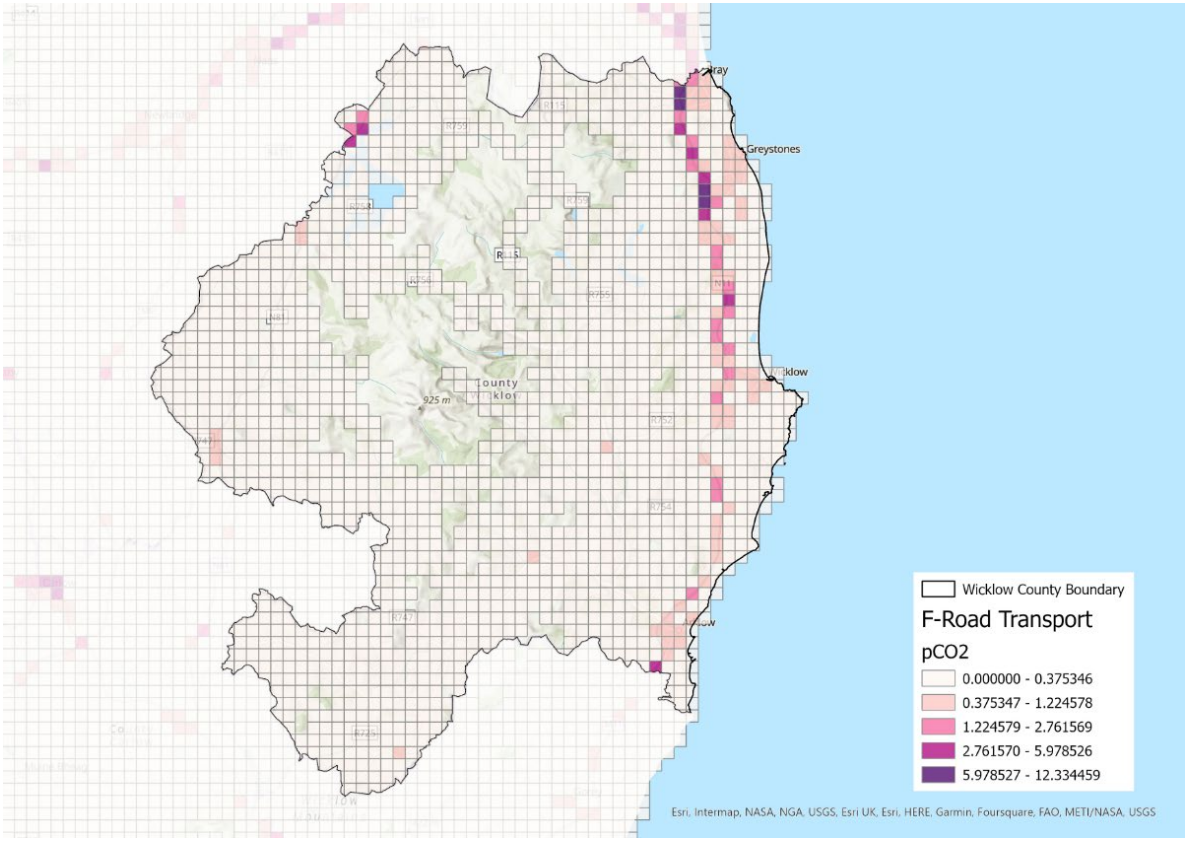
3.1.2 Tier 1 'Top-Down' Assessment: Results (2/4)

Transport (road)

The map shown here provides a visual representation of the carbon dioxide (CO_2) emissions associated with Road Transport. This includes the burning of diesel and petrol in combustion engines (passenger cars, light duty vehicles, heavy duty vehicles and buses, etc).

Note: the black line boundary reflects Wicklow County Council current administrative boundary.



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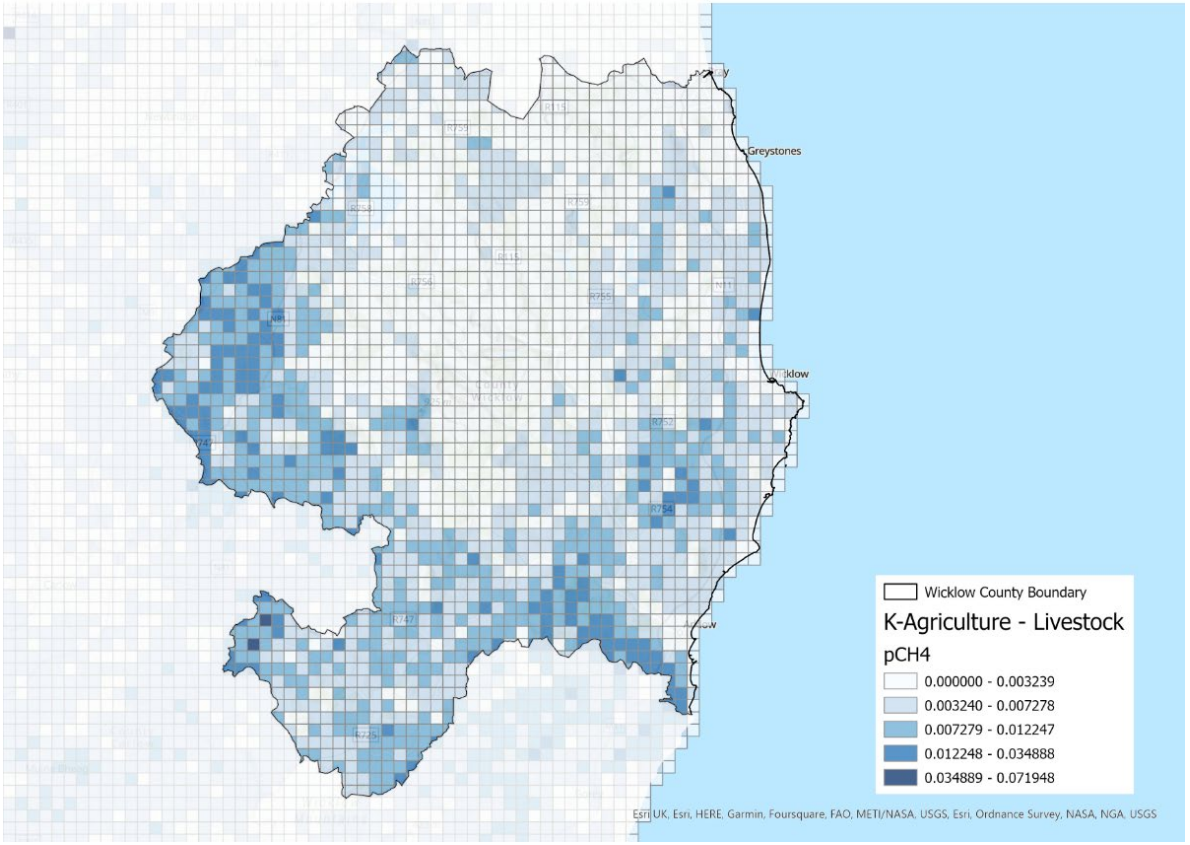
3.1.3 Tier 1 'Top-Down' Assessment: Results (3/4)

Agriculture

The map shown here provides a visual representation of the methane (CH_4) emissions associated with the agriculture sector. These emissions are primarily as a result of livestock farming and associated enteric fermentation.

Note: the black line boundary reflects Wicklow County Council current administrative boundary.



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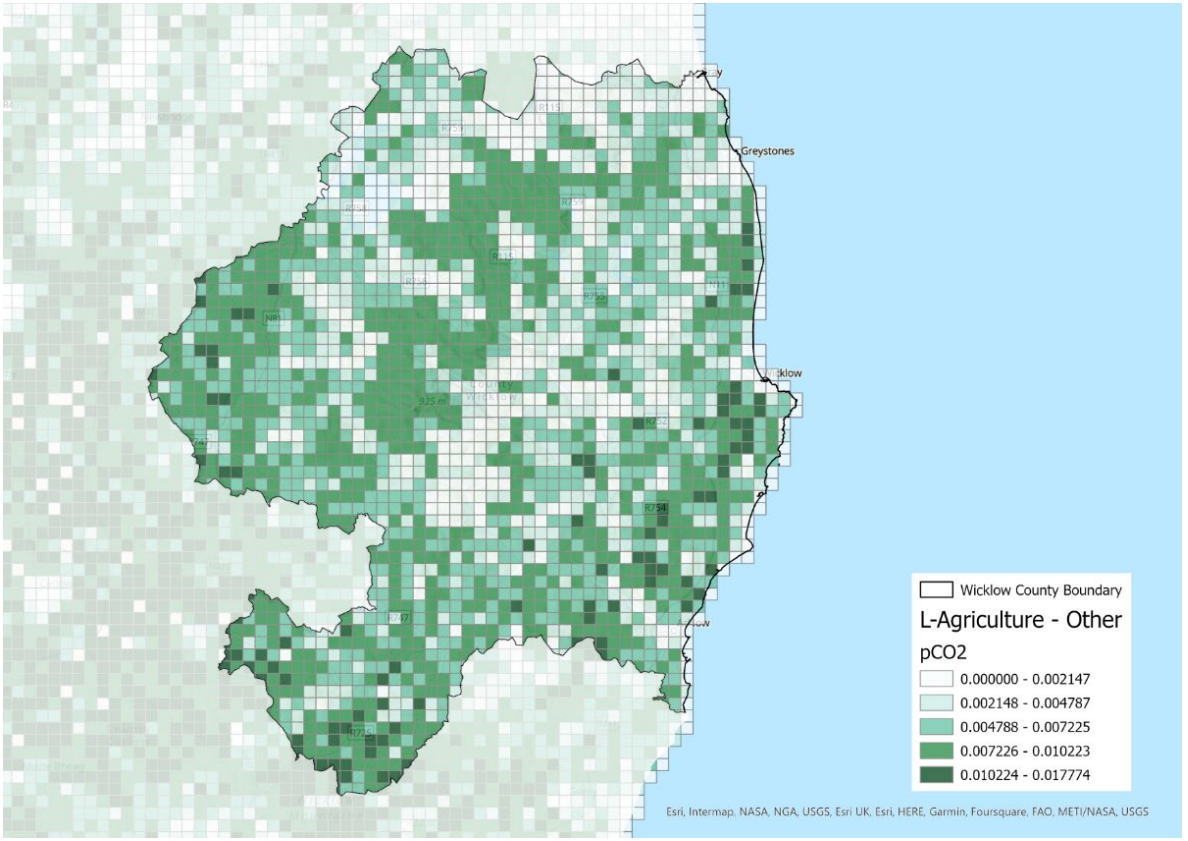
3.1.4 Tier 1 'Top-Down' Assessment: Results (4/4)

Agriculture

The map shown here provides a visual representation of the carbon dioxide (CO_2) emissions associated with the agriculture sector. These emissions are primarily as a result of on farm machinery use and farm buildings.

Note: the black line boundary reflects Wicklow County Council current administrative boundary.



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3.2 Tier 2 'Bottom-up' Assessment

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3.2.1 Methodology: Tier 2 'Top-Down' Assessment

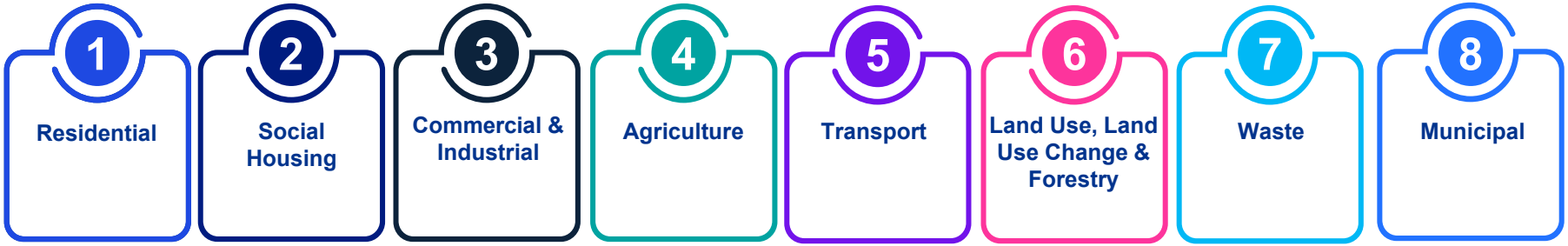
The Tier 2 'Bottom-up' approach allows for a more detailed look at drivers and hotspots of carbon emissions through the use of more detailed datasets. The purpose of this Tier 2 assessment approach is not to override the Tier 1 assessment outcomes, but rather to provide an additional layer of granularity to inform targeted decision making.

The assessment focuses on 8 key sectoral emissions sources, as detailed below. This report is structured around each sector individually, setting out key insights, results and analysis.

The assessment is highly dependant on the data made available by both public sector bodies and also the local authority.

All data sources, assumptions and limitations are set out clearly in this report and the supporting **Appendix.**

Key sectors:



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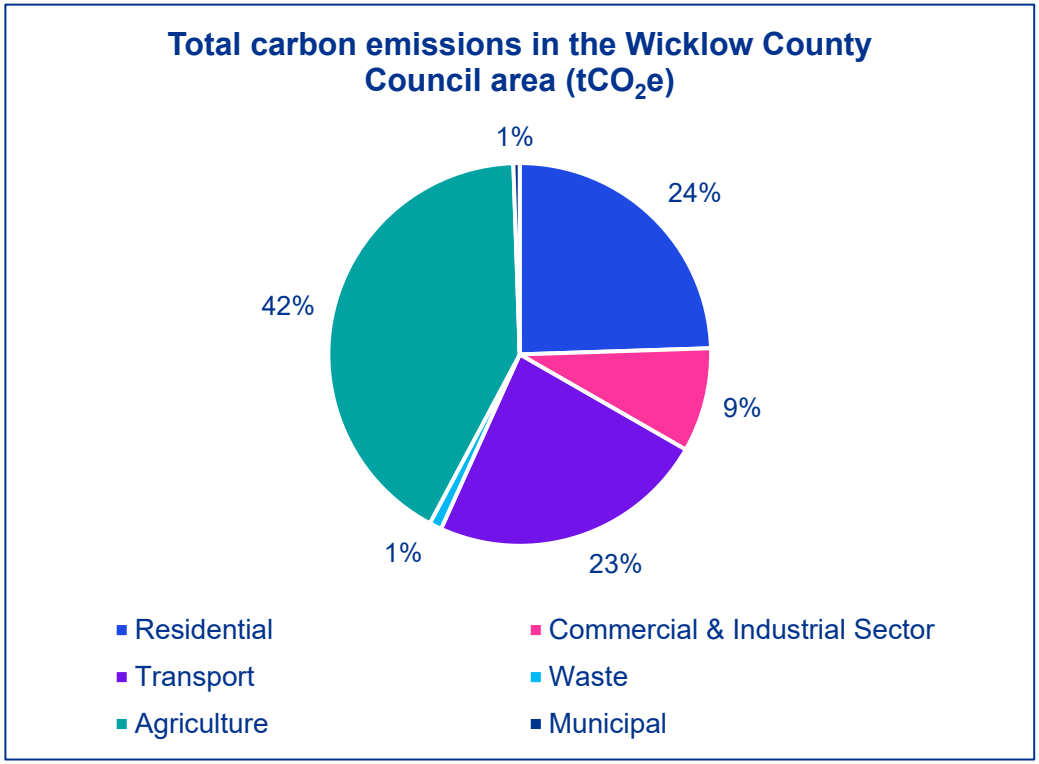
3.2.1.1 Summary Results

The results of the 'bottom-up' Tier 2 assessment are presented in the table and chart below.

Total carbon emissions equate to approximately **1,275,091 tCO_2e**. This translates to **8.95 tCO_2e per capita** based on 2016 census population data. In 2018, Ireland's national carbon emissions equated to approximately 12.6 tCO_2e per capita. While Wicklow County's carbon emissions per capita is lower than the national equivalent, Ireland is significantly higher than the EU average of 8.2 tCO_2e per capita.

	Carbon emissions (tCO_2e)
Residential	312,201
Commercial & Industrial Sector	112,246
Transport	299,115
Waste	13,308
Agriculture	531,399
Municipal	6,822
Total carbon emissions	**1,275,091**
Total carbon emissions per capita (tCO_2e/capita)	**8.95**



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3.2.2 Residential Sector: Approach

The ‘bottom-up’ approach (‘Tier 2’) used to calculate energy consumption and carbon emissions associated with the residential sector within the Wicklow County Council boundary has been calculated in four key steps as described below.

Data sources

01

CSO

Total housing stock obtained, grouped by period built and dwelling type.

02

SEAI BER Research Tool

The next step is determining the average energy for each dwelling type and period built related to the county using BER.
Total energy consumed for different dwelling types is calculated by multiplying average energy for a given dwelling type, and built period by the number of residential units for a given dwelling type and built period.

03

CSO

Total energy consumed broken down into fuel sources and electricity.
The percentage breakdown of central heating fuel in Wicklow was obtained from the CSO.

04

SEAI Conversion Factors

Total energy consumed converted to carbon emissions using SEAI Conversion Factors.

Outputs

- **Energy consumed broken down by fuel and electricity, dwelling type, and built period**
- **Carbon emissions broken down by fuel and electricity, dwelling type, and built period**

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3.2.3 Residential Sector: Results (1/2)

Total residential sector related energy consumption, broken down by building type and fuel type is shown below. The associated carbon emissions (tonnes CO_2e) are also shown. The results show that detached houses are the highest energy consuming and carbon emitting residential building type with oil being the highest consumed fuel.

	Energy consumption (MWh)								
Residential building type	**Coal**	**Peat**	**Oil**	**LPG**	**Natural Gas**	**Renewables**	**Electricity**	**Wood**	**Total (MWh)**
Detached house	35,970	7,424	339,383	4,855	271,983	7,481	49,353	31,667	**748,116**
Semi-detached house	14,775	3,050	139,407	1,994	111,721	3,073	20,272	13,008	**307,301**
Terraced house	7,974	1,646	75,240	1,076	60,297	1,658	10,941	7,020	**165,853**
Apartment, flat, bedsit	2,474	511	23,344	334	18,708	515	3,395	2,178	**51,457**
Total MWh	**61,194**	**12,630**	**577,374**	**8,259**	**462,709**	**12,727**	**83,961**	**53,873**	**1,272,727**

	Carbon emissions (tCO_2e)								
Residential building type	**Coal**	**Peat**	**Oil**	**LPG**	**Natural Gas**	**Renewables**	**Electricity**	**Wood**	**Total (tCO_2e)**
Detached house	12,251	2,642	92,855	1,113	55,675	-	18,517	477	**183,531**
Semi-detached house	5,032	1,085	38,142	457	22,869	-	7,606	196	**75,388**
Terraced house	2,716	586	20,586	247	12,343	-	4,105	106	**40,688**
Apartment, flat, bedsit	843	182	6,387	77	3,829	-	1,274	33	**12,624**
Total tCO_2e	**20,843**	**4,495**	**157,969**	**1,894**	**94,717**	**-**	**31,502**	**811**	**312,231**

The table below shows the central heating energy source split of occupied private households within the Wicklow County Council area (CSO 2016). Oil and Natural Gas are shown as the most commonly used fuel source.

Energy Source	% energy split across Wicklow households
Oil	45%
Natural gas	36%
Electricity	7%
Coal	5%
Peat	1%
LPG	1%
Wood	4%
Renewables	1%
Total	**100%**

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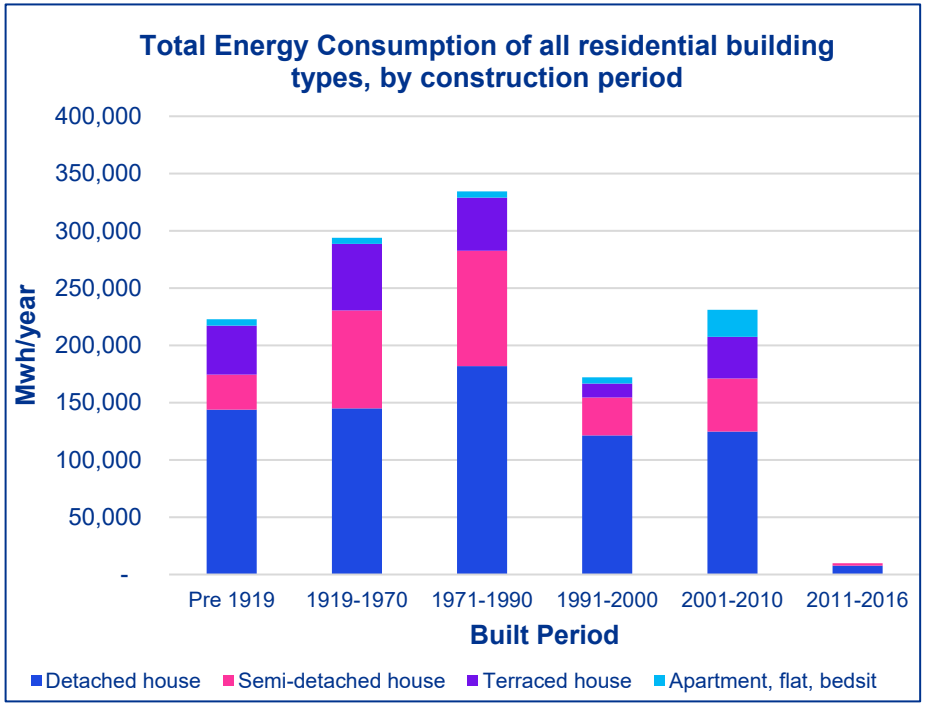
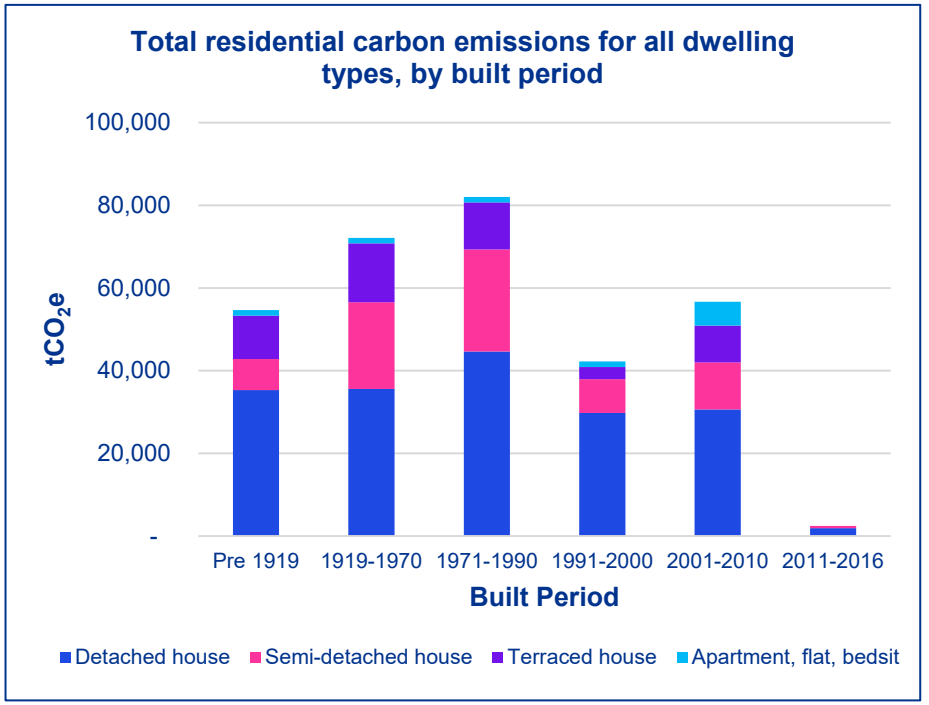
3.2.4 Residential Sector: Results (2/2)

Total residential sector related energy consumption -by building type and building construction period / age- is shown in the charts below. The associated carbon emissions (CO_2e) is also shown.

Buildings built during the '1971-1990' construction period are responsible for the largest proportion of total energy consumed and also total carbon emissions, both at 26.5%. This can be expected as approximately 26.3% of all dwellings were constructed during this period.





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3.2.5 Residential Sector: Social Housing: Approach

The ‘bottom-up’ approach (‘Tier 2’) used to calculate energy consumption and carbon emissions associated with the residential sector social housing within the Wicklow County Council boundary has been calculated in four key steps as described below.

Data sources

01

Wicklow County Council

Total housing stock provided by Wicklow County Council. A weighted average was applied to distribute by dwelling type and built period.

02

SEAI BER Research Tool

By filtering the BER Research tool to only include social housing, the average energy for each dwelling type and period built related to the county using BER is determined.
Total energy consumed for different dwelling types is calculated by multiplying average energy for a given dwelling type, and built period by the number of residential units for a given dwelling type and built period

03

CSO

Total energy consumed broken down into fuel sources and electricity.
The percentage breakdown of central heating fuel in Wicklow was obtained from the CSO

04

SEAI Conversion Factors

Total energy consumed converted to carbon emissions using SEAI Conversion Factors

Outputs

- **Energy consumed broken down by fuel and electricity, dwelling type, and built period**
- **Carbon emissions broken down by fuel and electricity, dwelling type, and built period**

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3.2.6 Residential Sector: Social Housing: Results (1/2)

Total residential sector social housing related energy consumption, broken down by building type and fuel type is shown below. The associated carbon emissions (tCO_2e) are also shown. The results show that detached houses are the highest energy consuming and carbon emitting residential building type with oil being the highest consumed fuel.

Residential building type	Coal	Peat	Oil	LPG	Natural Gas	Renewables	Electricity	Wood	Total (MWh)
Detached house	2,474	510	23,326	335	18,698	514	3,395	2,180	**51,433**
Semi-detached house	1,082	223	10,198	146	8,175	225	1,484	953	**22,487**
Terraced house	640	132	6,029	87	4,833	133	877	563	**13,294**
Apartment, flat, bedsit	306	63	2,885	41	2,312	64	420	270	**6,360**
Total MWh	**4,502**	**929**	**42,438**	**609**	**34,018**	**935**	**6,176**	**3,966**	**93,574**

Residential building type	Coal	Peat	Oil	LPG	Natural Gas	Renewables	Electricity	Wood	Total (tCO_2e)
Detached house	843	182	6,382	77	3,827	-	1,274	33	**12,617**
Semi-detached house	368	79	2,790	34	1,673	-	557	14	**5,516**
Terraced house	218	47	1,650	20	989	-	329	8	**3,261**
Apartment, flat, bedsit	104	22	789	9	473	-	158	4	**1,560**
Total tCO_2e	**1,533**	**330**	**11,611**	**140**	**6,964**	**-**	**2,317**	**60**	**22,955**

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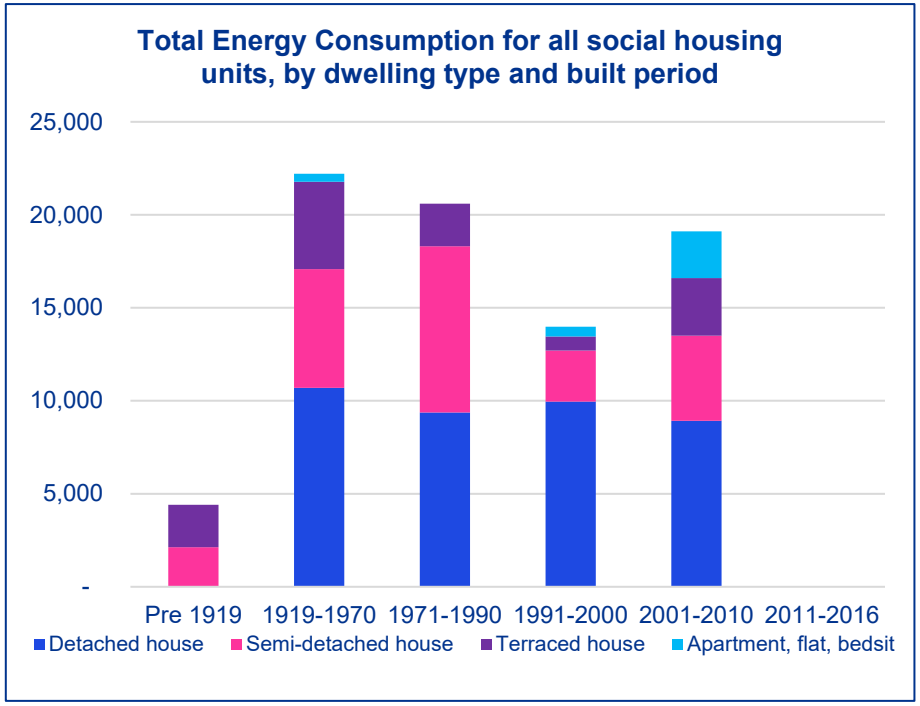
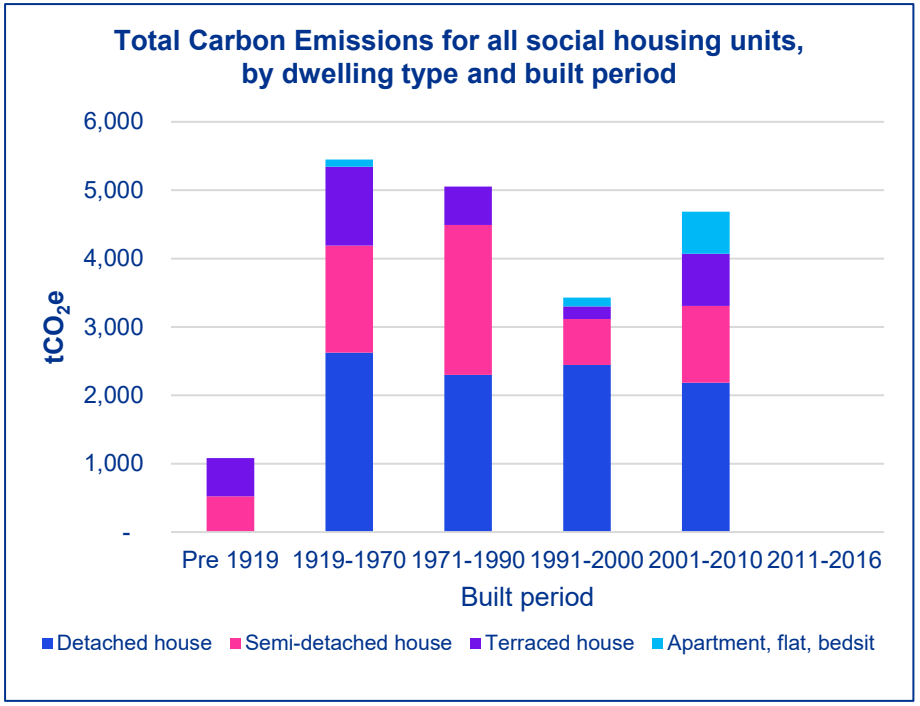
3.2.7 Residential Sector: Social Housing: Results (2/2)

Total residential sector social housing related energy consumption - by building type and building construction period / age is shown in the charts below. The associated carbon emissions (CO_2e) are also shown.





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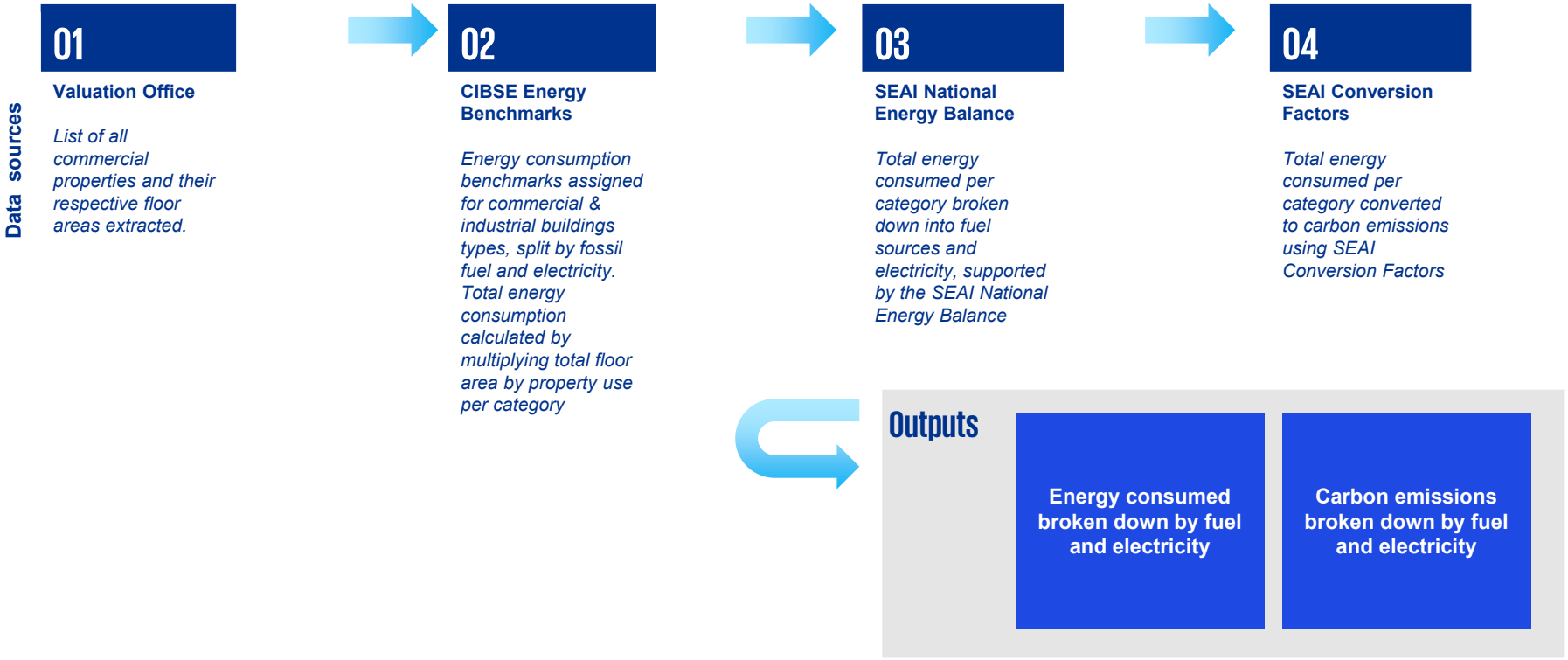
3.2.8 Commercial & Industrial Sector: Approach

The ‘bottom-up’ approach (‘Tier 2’) used to calculate energy consumption and carbon emissions associated with the commercial and industrial sector within the Wicklow County Council boundary has been calculated in four key steps as described below.



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3.2.9 Commercial & Industrial Sector: Results

Total commercial and industrial sector related energy consumption, broken down by building type, area, fuel and electricity consumption are shown below. Retail buildings occupy the largest floor area of all building types and also account for the highest electricity use. Industrial use buildings occupy one of the smallest floor areas but account for the highest fossil fuel consumption.

Commercial / Industrial building type	Area (m^2)	Fossil Fuels (MWh)	Electricity (MWh)
Fuel/ Depot	2,217	379	353
Health	13,215	639	179
Hospitality	120,909	79,555	38,578
Industrial Uses	4,501	128,623	-
Leisure	54,601	32,651	8,299
Minerals	4,501	935	808
Office	141,680	21,394	12,043
Retail (Shops)	211,541	35,645	60,642
Retail (Warehouse)	63,447	10,723	4,251
Total	**614,396**	**310,544**	**125,153**

Total commercial and industrial sector related energy consumption, broken down by fuel type and electricity are shown below. Natural Gas is the highest consumed fuel source.

Energy Source	Total energy consumption by energy source (kWh)	Total carbon emissions by energy source (tCO_2e)
Coal	265	90
Oil	122,735	30,922
Natural Gas	167,450	34,277
Renewables	20,094	-
Electricity	125,153	46,958
Total	**435,698**	**112,246**

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3.2.10 Agriculture Sector: Approach

The ‘bottom-up’ approach (‘Tier 2’) used to calculate energy consumption and carbon emissions associated with the agriculture sector within the Wicklow County Council boundary has been calculated in four key steps as described below.

Data sources

01

CSO

Total no. of different livestock types and total area of different crops obtained.

02

Teagasc, Defra

Energy consumption benchmarks assigned for livestock and different crops, split by fossil fuel and electricity use. Total energy consumption calculated by multiplying total crop area/ no. of livestock by benchmark per category.

03

SEAI Conversion Factors

Total energy consumed per category converted to carbon emissions using SEAI Conversion Factors.

04

Teagasc

Benchmarks assigned to measure the impact of enteric fermentation of livestock types.

Outputs

- **Energy consumption rates for cropland and livestock within Wicklow County Council, broken down by energy use**
- **Carbon emissions broken down by diesel and electricity and livestock**
- **Enteric fermentation related carbon emissions presented by livestock**
- **Total carbon emissions by emissions source**

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3.2.11 Agriculture Sector: Results (1/3)

Cropland: Total cropland energy consumption and related carbon emissions is shown below, based on hectares of land farmed farms in Wicklow County Council area.

Cropland	Hectares (Ha) of cropland farming	Energy requirements (MWh)			Carbon emissions (tCO_2e)		
		Electricity	Heating	Mobile Machinery	Electricity	Heating	Mobile Machinery
Total crops, fruit & horticulture	3,236	12,444	2,427	3,721	4,669	624	982
Total cereals	10,727	4,979	1,467	15,888	1,868	377	4,193
Total cropland	13,963	17,423	3,894	19,609	6,537	1,001	5,175
	Total	**40,926**			**12,713**		

Livestock fuel combustion: Total on-farm fuel combustion and electricity use, and associated carbon emissions on livestock farms is shown below, based on number of livestock on farms in Wicklow County Council area.

Livestock	No. of Livestock on farms	Energy requirements (MWh)			Carbon emissions (tCO_2e)		
		Electricity	Heating	Mobile Machinery	Electricity	Heating	Mobile Machinery
Total cattle	131,382	15,498	-	64,142	5,815	-	16,927
Total sheep	323,367	-	-	6,144	-	-	1,621
Total pigs	15,957	80	319	16	30	82	4
Total poultry	36,944	37	-	-	14	-	-
Total livestock	**507,650**	**15,615**	**319**	**70,302**	**5,859**	**82**	**18,553**
	Total	**86,236**			**24,493**		

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3.2.12 Agriculture Sector: Results (2/3)

Sheep, Beef Cattle, & Dairy enteric fermentation: Methane emissions produced by livestock enteric fermentation is one of the main contributors to agriculture's total carbon emissions. As the majority of livestock in the county council area are beef cattle, dairy cows, and sheep (~90% of total livestock), to provide for a meaningful and proportionate assessment, these livestock have been focussed on.

To estimate methane emissions associated with cattle and sheep within the Wicklow County Council area, benchmarks (gCH_4/livestock/day) have been used and are presented in the Appendix. Estimated carbon emissions related to enteric fermentation in beef cattle and dairy cows is presented below.

Livestock	No. of total livestock on farms	Methane Emissions (tCH_4/year)	Carbon emissions (tCO_2e)*
Dairy Cows	47,687	10,081	281,262
Beef Cattle	83,695	5,744	160,255
Total Sheep	323,367	1,888	52,676
Total	**454,749**	**17,713**	**494,193**

** Note that methane emissions (CH_4) have been converted to carbon dioxide equivalent (CO_2e) using IPCC conversion factors as included in the **Appendix**.*

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3.2.13 Agriculture Sector: Results (3/3)

Total carbon emissions: Total carbon emissions within the agricultural sector, broken down by source, are shown below. Carbon emissions related to enteric fermentation in sheep, beef cattle and dairy cows account for the majority of emissions related to the sector.

Agricultural sector emissions source	Carbon emissions (tCO_2e)
Cropland	12,713
Livestock fuel combustion	24,493
Enteric fermentation	494,193
Total	**531,399**

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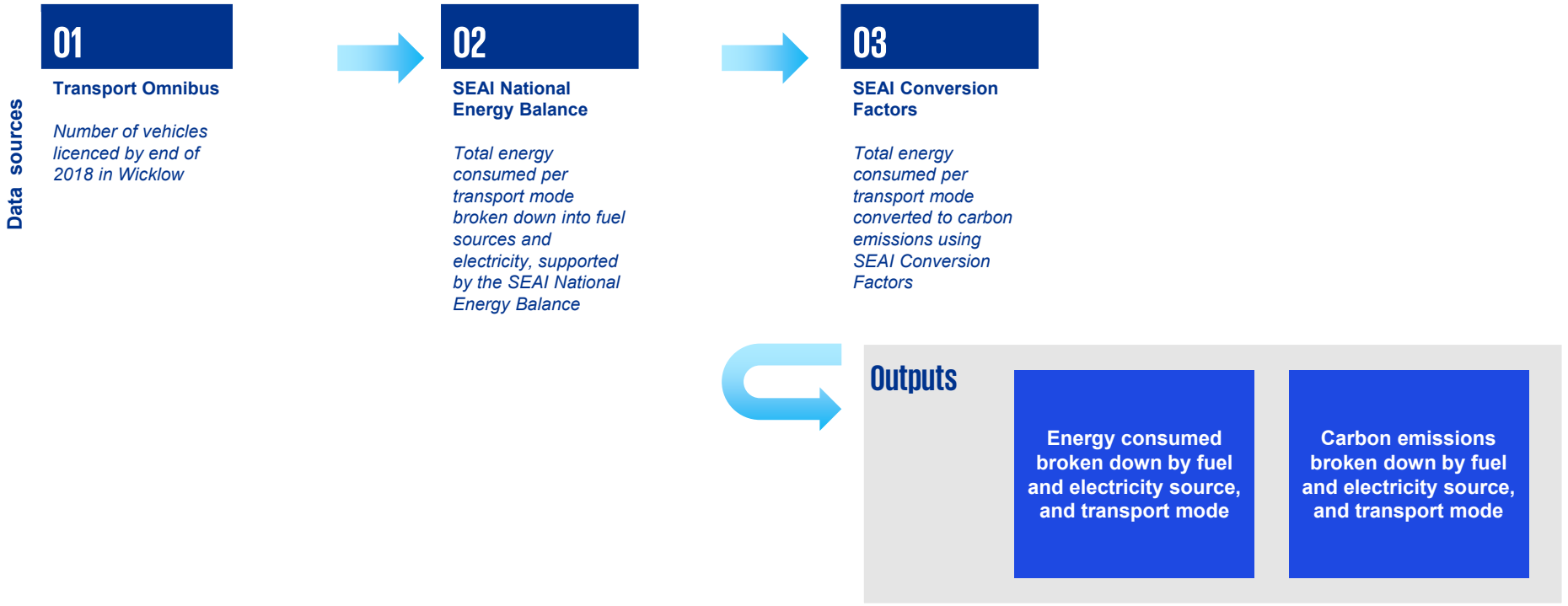
3.2.14 Transport Sector: Approach

The ‘bottom-up’ approach (‘Tier 2’) used to calculate energy consumption and carbon emissions associated with the transport sector within the Wicklow County Council boundary has been calculated in three key steps as described below.



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3.2.15 Transport Sector: Results

Total transport sector related energy consumption and associated carbon emissions, broken down by transport mode, fuel and electricity consumption are shown below. Road Private Cars are the transport mode that accounts for the highest proportion of both total energy consumption and carbon emissions, at approx. ~65.5% of both.

Transport mode	Energy Consumption (MWh)							
	Gasoline	LPG	Gasoil / Diesel /DERV	Natural Gas	Biodiesel	Bioethanol	Electricity	Total
Road Freight	-	-	261,984	11	11,231	-	-	**273,215**
Road Light Goods Vehicle	-	-	103,104	-	4,420	-	-	**107,524**
Road Private Car	254,933	700	495,965	-	21,262	8,442	403	**781,704**
Public Passenger Services	1,374	-	26,546	-	1,138	45	-	**29,104**
Total	**256,307**	**700**	**887,599**	**11**	**197,751**	**8,487**	**403**	**1,191,557**

Transport mode	Carbon emissions (tCO_2e)							
	Gasoline	LPG	Gasoil / Diesel /DERV	Natural Gas	Biodiesel	Bioethanol	Electricity	Total
Road Freight	-	-	69,137	2	-	-	-	**69,140**
Road Light Goods Vehicle	-	-	27,209	-	-	-	-	**27,209**
Road Private Car	64,218	160	130,885	-	-	-	151	**195,414**
Public Passenger Services	346	-	7,006	-	-	-	-	**7,352**
Total	**64,564**	**160**	**234,237**	**2**	**-**	**-**	**151**	**299,115**

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3.2.16 LULUCF Sector: Approach

The ‘bottom-up’ approach (‘Tier 2’) used to explore the LULUCF sector in Wicklow County Council has been based on the Corine dataset.

Data sources

01

Corine dataset

Spatially led land use types for Wicklow County Council extracted.

Outputs

Main land use types within Wicklow County Council

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3.2.17 LULUCF Sector: Results (1/2)

The top land use types (~95%) within the Wicklow County Council boundary area are shown below, alongside the associated hectares and the % of total area each accounts for. A full list is given in the **Appendix.**

Type of Land Use (as per Corine 2018)	Area (hectares (ha))	% of Wicklow County Council area
Pastures	86,768	43%
Coniferous forest	22,177	11%
Moors and heathland	19,128	9%
Peat bogs	18,087	9%
Non-irrigated arable land	11,109	6%
Land principally occupied by agriculture, with significant areas of natural vegetation	10,737	5%
Transitional woodland-shrub	9,593	5%
Mixed forest	6,202	3%
Discontinuous urban fabric	3,958	2%
Broad-leaved forest	3,622	2%
Total	191,381	95%

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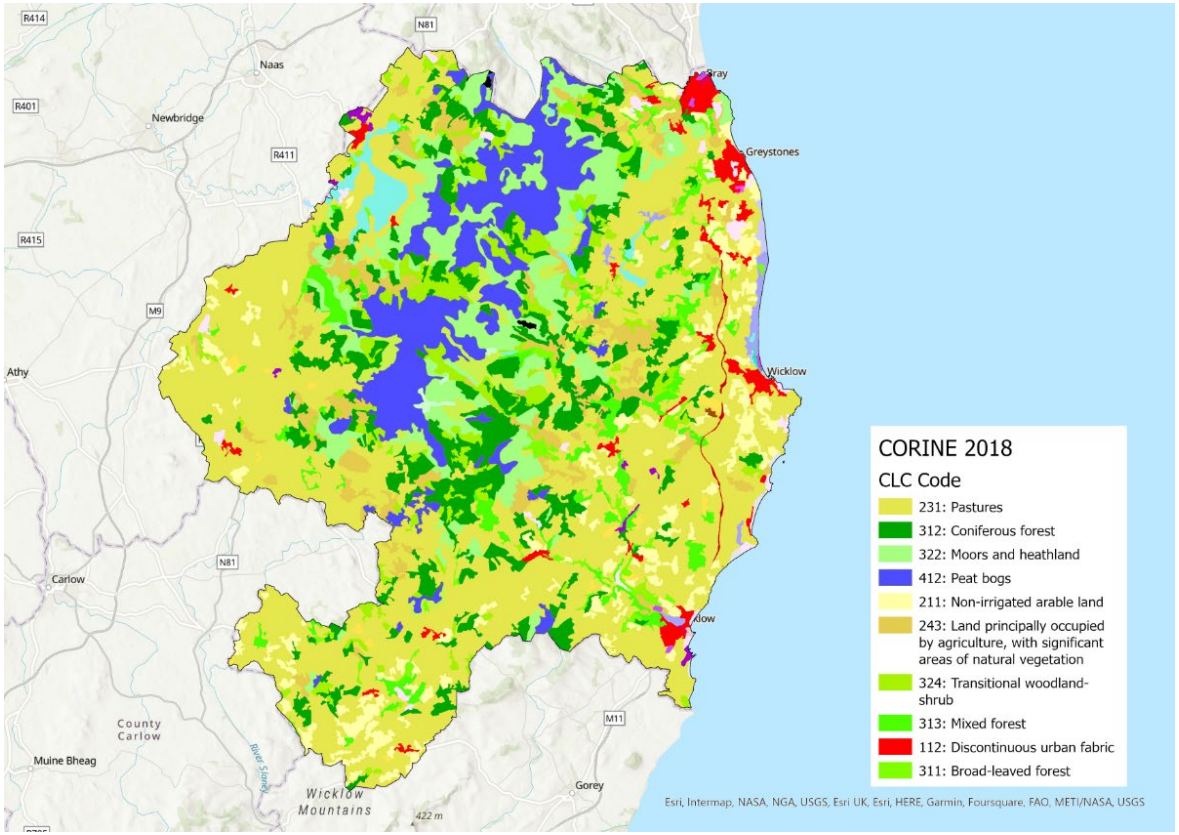
3.2.18 LULUCF Sector: Results (2/2)

LULUCF

Corine database has been utilised to understand land uses within the Wicklow County Council area.

The map shown here provides a visual representation of land use types which cover ~94.5% of the Wicklow County Council area (10 land use types). Note that 'pastures', cover more than 40% of the Wicklow County Council area.

Note: the black line boundary reflects Wicklow County Council current administrative boundary.



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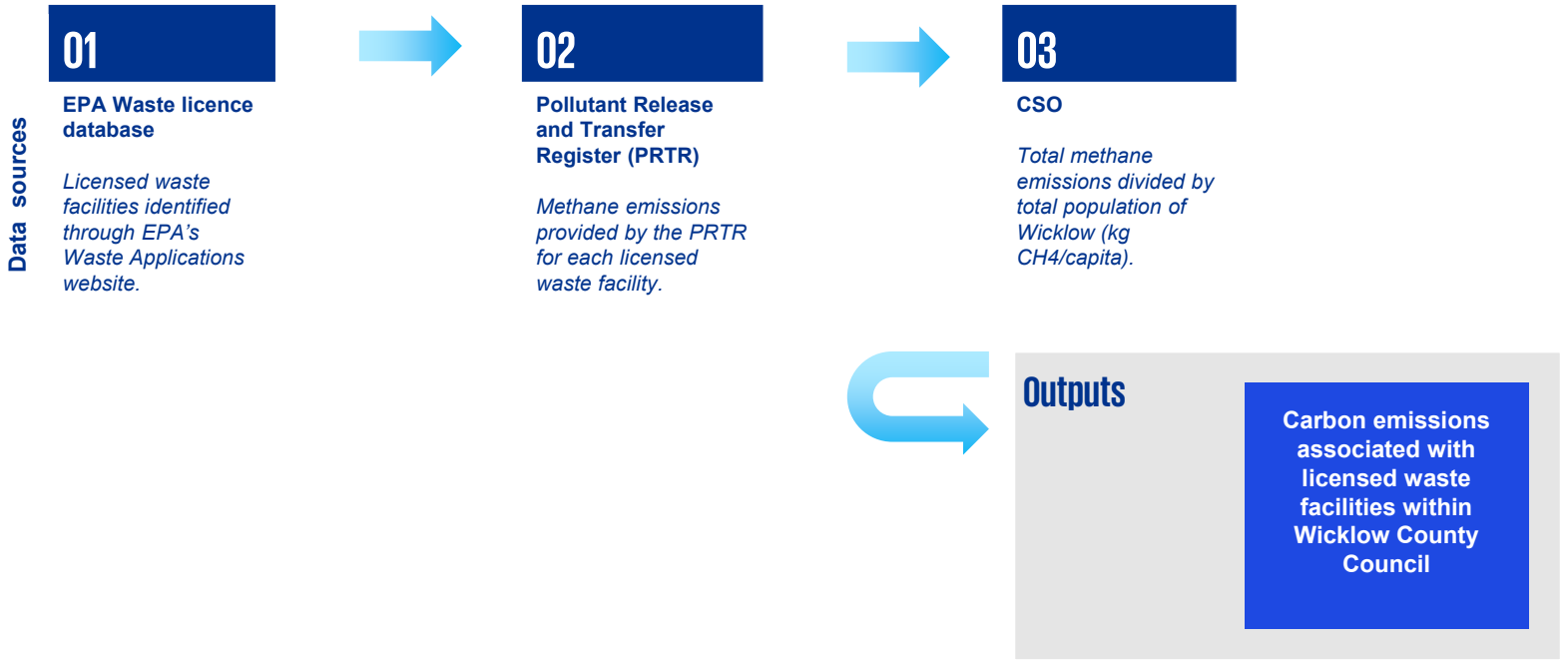
3.2.19 Waste Sector: Approach

The ‘bottom-up’ approach (‘Tier 2’) used to calculate energy consumption and carbon emissions associated with the waste sector within the Wicklow County Council boundary has been calculated in three key steps as described below.



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3.2.20 Waste Sector: Results

Methane emissions associated with identified waste facilities within Wicklow County Council is shown below. Emissions per capita are also provided to allow for further understanding of emissions attributable to the boundary area at a later stage. Note that this does not provide a complete picture of waste facilities and methane emissions within the Wicklow County Council boundary area due to data limitations.

Waste facility name and address	Total methane emissions ($kgCH_4$)	Total methane emissions (tCH_4)
Ballymurtagh Landfill Facility, Ballymurtagh, Ballygahan Upper, Ballygahan Lower, Tinnahinch, Wicklow.	155,866	156
Rampere Landfill, Rampere, Wicklow.	112,886	113
Ballynagran Residual Landfill, Ballynagran, Coolbeg and Kilcandra, Wicklow.	198,577	199
	Total	**467**

Total tCH_4/capita
0.0033

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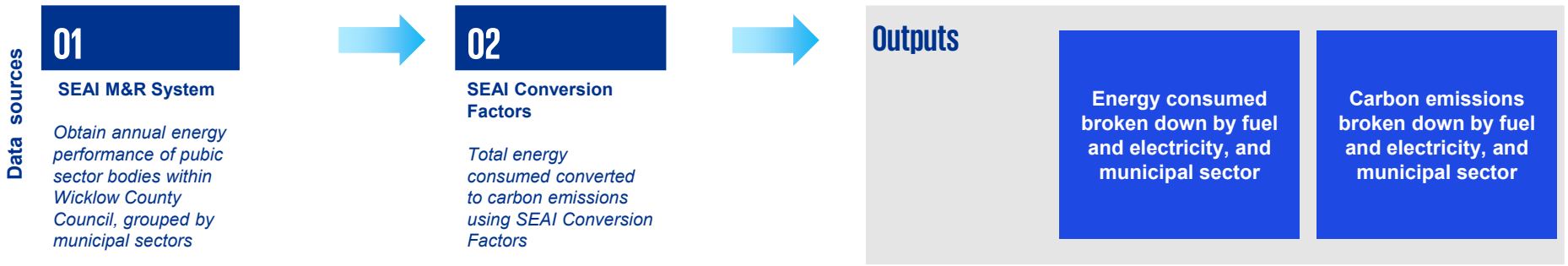
3.2.21 Municipal Sector: Approach

The ‘bottom-up’ approach (‘Tier 2’) used to calculate energy consumption and carbon emissions associated with the municipal sector within the Wicklow County Council boundary has been calculated in two key steps as described below.



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3.2.22 Municipal Sector: Results

The tables below show the total energy consumption and carbon emissions of the Municipal Sector, grouped by fuel type and sector. Municipal Buildings/ facilities account for the highest energy consumption and carbon emissions.

Sector	Electricity (MWh)	Fossil Fuel (MWh)						Renewable Energies (MWh)				Total (MWh)
		Natural Gas	Liquid Gas	Kerosene	Gasoil	Diesel	Gasoline	Biofuel	Other Biomass	Onsite Generation	Solar Thermal	
Municipal Buildings/ Facilities	9,617	7,851	-	44	494	-	-	-	-	21	-	**18,027**
Public Lighting	675	-	-	-	-	-	-	-	-	-	-	**675**
Municipal Fleet	-	-	-	-	-	4,518	78	193	-	-	-	**4,789**

Sector	Electricity (tCO_2e)	Fossil Fuel (tCO_2e)						Renewable Energies (tCO_2e)				Total (tCO_2e)
		Natural Gas	Liquid Gas	Kerosene	Gasoil	Diesel	Gasoline	Biofuel	Other Biomass	Onsite Generation	Solar Thermal	
Municipal Buildings/ Facilities	3,608	1,607	-	11.36	130	-	-	-	-	-	-	**5,357**
Public Lighting	253	-	-	-	-	-	-	-	-	-	-	**253**
Municipal Fleet	-	-	-	-	-	1,192	20	-	-	-	-	**1,212**

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04
Appendices

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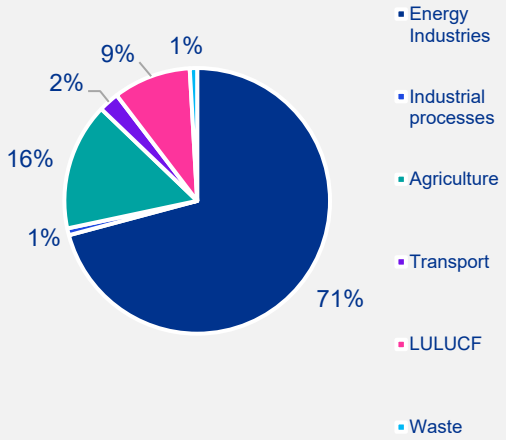
4.1 Tier 1 'Top-Down' Assessment: Extended Results

Results of the Tier 1 'Top-down' assessment are further illustrated here, broken down by the relevant greenhouse gases (GHG), i.e. carbon dioxide (CO_2), methane (CH_4), nitrous oxide (N_2O). This illustration provides an important breakdown of emissions sources by greenhouse gas, which supports deeper understanding of sectors and their emissions sources as well as supporting decision making on the biggest drivers for change or hotspots of emissions.

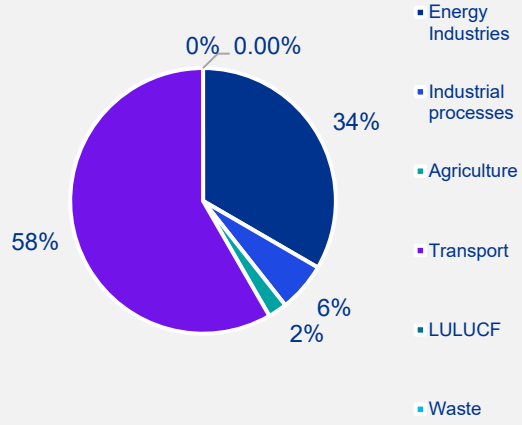
Note that each impact of GHGs on climate change and global warming differs by gas. To understand and compare impacts across GHGs, the Global Warming Potential (GWP) is used. This GWP provides a common unit of measure reflecting how much energy the emissions of 1 tonne of a GHG will absorb over a given period of time relative to the emissions of 1 tonne of CO_2. The table below provides an overview of the GWP of CO_2, CH_4 and N_2O, as aligned to the Intergovernmental Panel on Climate Change (IPCC) Sixth Assessment Report (AR6):

GHG	GWP
CO_2	1
CH_4	27.9
NO_2	273

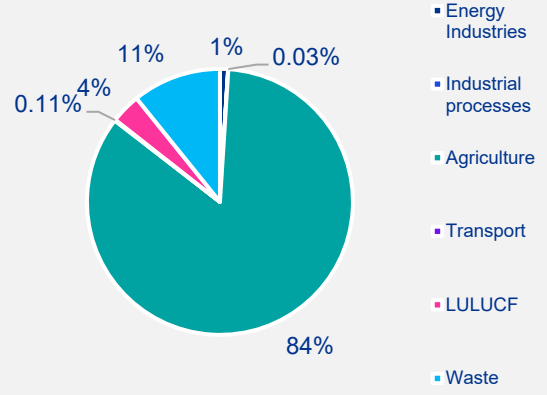
Total nitrous oxide (N_2O) emissions presented by sector



Total carbon dioxide (CO_2) emissions presented by sector



Total methane (CH_4) emissions presented by sector



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4.2 Tier 1 'Top-Down' Assessment: Data sources, assumptions & limitations

Emissions source	Data source	Assumptions & Limitation
Carbon emissions associated with the following sectors: • Energy Industries, • Industrial processes, • Agriculture, • Transport, • LULUCF, and • Waste sectors	**MapEIre database** Source: https://projects.au.dk/mapeire	• MapEIre database has been used to extract emissions within the Wicklow County Council boundary. • MapEIre database provides spatial emissions for two years, consistent with 2018 and 2021 national emissions inventory reporting. For Wicklow County Council's BEI, data consistent with 2018 national emissions inventory reporting has been used. • Data extracted from the MapEIre database has been assigned to the relevant sectors (Energy Industries, Industrial processes, Agriculture, Transport, LULUCF & Waste). • Note 1: emissions extracted from the MapEIre database are consistent with the emissions published within the EPA's national emission inventory • Note 2: The gridding of the national emissions are done in the MapEIre system via use of a number of GeoKeys (normalized tables for spatial distributing of emissions). The GeoKeys are prepared separately for the emission sources, sub-sectors or sectors, depending on the availability of detailed spatial data. The sectors listed in your table are aggregation of a number of sources, which are gridded by using different GeoKeys which again are based on different spatial data. • Note 3: The methodology and the GeoKeys, including the data behind the GeoKeys, are described in the documentation report available on the MapEIre website: • https://projects.au.dk/mapeire/publications • https://projects.au.dk/fileadmin/projects/mapeire/Documents_and_presentations/MapEIre_technical_documentation_report.pdf

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4.3 Tier 2 'Bottom-Up' Assessment: Data sources, assumptions & limitations

Residential sector:

Data Source	Assumption & Limitation
• **CSO** Source: https://data.cso.ie/	• Data from CSO has been gathered for Number of dwellings within the Wicklow County Council area. The data is reflective of 2016 census year. • The households were grouped into four dwelling types. To account for 'not stated households, the four dwelling types were each given a weighted average, and the 'not stated' were then distributed according to these percentages. • The dwelling types were also grouped by building regulation periods. The building regulations periods of 2001-2005, 2006-2011, and 2012 onwards were split 2001-2010, and 2011-2016 to reflect CSO data.
• **SEAI BER Research Tool** Source: https://ndber.seai.ie/BERResearchTool/ber/search.aspx	• The average energy consumption per dwelling type and built period was obtained from the BER Research Tool. • A limitation of the tool is that it is not a full representation of the total housing stock in Wicklow as the legalisation to obtain a certificate only came into effect in 2009. • For the purpose of this assessment, only 'Existing' and 'Provisional' ratings were selected to determine the average energy consumption per dwelling type and built period. 'Provisional' ratings were excluded from the extracted data.
• **CSO** Source: https://data.cso.ie/	• CSO data reflective of 2016 has been used to inform fuel type breakdown within the residential sector. This data is reflective of Wicklow residential sector activities. • The number of households with 'other' stated as their primary central fuel type were assumed to source their central heating from renewables. • To account for the number of households with 'not stated' and 'no central heating' fuel types, the eight fuel types were given a weighted average, and the 'not stated' and 'no central heating' were then distributed according to these percentages.
• **SEAI Conversion Factors** Source: https://www.seai.ie/publications/Energy-in-Ireland-2019-.pdf	• The SEAI conversion factors represent the most robust carbon benchmarks for fuel types in Ireland.

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4.4 Tier 2 'Bottom-Up' Assessment: Data sources, assumptions & limitations

Social Housing:

Data Source	Assumption & Limitation
• **Wicklow County Council** Source:	• Data from Wicklow County Council has been gathered for number of social housing units within the Wicklow County Council area. The data extracted is reflective of the years 1899 to 2018. • The dwelling types were grouped by building regulation periods. The building regulations periods of 2001-2005, 2006-2011, and 2012 onwards were split 2001-2010, and 2011-2016 to reflect CSO data. • The data extracted did not state dwelling type. • A large proportion of the housing stock (44%) was stated as being built in the year 1900. This figure was considered inconsistent following a comparison with the number of dwellings built Pre 1919 listed in CSO data and the BER Research tool. • To determine the breakdown of social housing units built per built period and dwelling type, the percentage split of total housing determined during the residential sector was multiplied by the total number of social housing units.
• **SEAI BER Research Tool** Source: https://ndber.seai.ie/BERResearchTool/ber/search.aspx	• The average energy consumption per dwelling type and built period was obtained from the BER Research Tool. Only ratings stated as 'social housing letting' were selected. • A limitation of the tool is that it is not a full representation of the total housing stock in Wicklow as the legalisation to obtain a certificate only came into effect in 2009. • For the purpose of this assessment, only 'Existing' and 'Provisional' ratings were selected to determine the average energy consumption per dwelling type and built period. 'Provisional' ratings were excluded from the extracted data.
• **CSO** Source: https://data.cso.ie/	• CSO data reflective of 2016 has been used to inform fuel type breakdown within the residential sector. This data is reflective of Wicklow residential sector activities. • The number of households with 'other' stated as their primary central fuel type were assumed to source their central heating from renewables. • To account for the number of households with 'not stated' and 'no central heating' fuel types, the eight fuel types were given a weighted average, and the 'not stated' and 'no central heating' were then distributed according to these percentages.
• **SEAI Conversion Factors** Source: https://www.seai.ie/publications/Energy-in-Ireland-2019-.pdf	• The SEAI conversion factors represent the most robust carbon benchmarks for fuel types in Ireland.

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4.5 Tier 2 'Bottom-Up' Assessment: Data sources, assumptions & limitations

Commercial & Industrial sector:

Data Source	Assumption & Limitation
• **Valuation Office** Source: https://www.valoff.ie/en/check-property-valuation-online/	• A list of all the commercial properties within the Wicklow County Council area was obtained from the Valuation Office. • The VO data is generated manually. The data was filtered for any negative or very small floor area figures.
• **CSO** Source: https://www.cso.ie/en/releasesandpublications/ep/p-ndber/non-domesticbuildingenergyratingsquarter32022/	• The VO data did not contain the respective floor areas of the listed properties within the hospitality sector in Wicklow. The total area of the hospitality sector was calculated using by multiplying the CSO average floor area for Restaurants/ Public Houses and Hotels by the number properties listed in the VO data.
• **Chartered Institution of Building Services Engineers (CIBSE) Energy Benchmarking Tool** Source: https://www.cibse.org/knowledge-research/knowledge-resources/knowledge-toolbox/energy-benchmarking-tool	• CIBSE benchmarks are a UK data source based on energy consumption data gathered in the UK. The benchmarks do not reflect actual energy consumption in the Wicklow area but are considered a good proxy.
• **SEAI National Energy Balance** Source: https://www.seai.ie/publications/Previous-Energy-Balances.xlsx	• The national energy split reflects energy consumption of the commercial and public sector at a national level. Although not an actual reflection of energy consumption at Wicklow County level, it is a considered to be a good proxy
• **SEAI Conversion Factors** Source: https://www.seai.ie/publications/Energy-in-Ireland-2019-.pdf	• The SEAI conversion factors represent some of the most robust carbon benchmarks for fuel types in Ireland and would be considered a strong proxy for carbon calculations in the county.

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4.6 Tier 2 'Bottom-Up' Assessment: Data sources, assumptions & limitations

Agriculture:

Data Source	Assumption & Limitation
• **CSO** Source: https://data.cso.ie/	• Data from CSO has been gathered for number of farms, total number of livestock, on farms, and total area of cropland.
• **Teagasc, Department for Environment, Food & Rural Affairs (DEFRA) Various sources**	• Energy consumption benchmarks have been used to understand the energy consumption from electricity, heating and mobile machinery requirements for livestock and cropland farming. • Limited data is available on cropland energy usages and consumptions and therefore, the analysis is limited in terms of providing more detail on related carbon emissions. • Benchmarks to measure the impact of enteric fermentation have been used.
• **SEAI Conversion Factors** Source: https://www.seai.ie/publications/Energy-in-Ireland-2019-.pdf	• The SEAI conversion factors represent some of the most robust carbon benchmarks for fuel types in Ireland and would be considered a strong proxy for carbon calculations in the county.

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4.7 Tier 2 'Bottom-Up' Assessment: Data sources, assumptions & limitations

Transport:

Data Source	Assumption & Limitation
• **Transport Omnibus 2018** Source: https://www.cso.ie/en/releasesandpublications/ep/p-tranom/transportomnibus2018/	• Transport Omnibus provides the number of vehicles licenced by end of 2018 in Wicklow.
• **SEAI National Energy Balance** Source: https://www.seai.ie/publications/Previous-Energy-Balances.xlsx	• The national energy split reflects energy consumption of the transport sector at a national level. Although not an actual reflection of energy consumption at Wicklow County level, it is a considered to be a good proxy
• **SEAI Conversion Factors** Source: https://www.seai.ie/publications/Energy-in-Ireland-2019-.pdf	• The SEAI conversion factors represent some of the most robust carbon benchmarks for fuel types in Ireland and would be considered a strong proxy for carbon calculations in the county.

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4.8 Tier 2 'Bottom-Up' Assessment: Data sources, assumptions & limitations

LULUCF:

Data Source	Assumption & Limitation
• **Corine database** Source: https://gis.epa.ie/GetData/Download	• The Corine dataset was used to show a visual representation of CO2 by sector. • The Corine dataset does not contain CO2 emissions of every sector.

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4.9 Tier 2 'Bottom-Up' Assessment: Data sources, assumptions & limitations

Waste Sector:

Data Source	Assumption & Limitation
• **EPA Waste licence database** Source: https://epawebapp.epa.ie/terminalfour/waste/index.jsp	• The EPA lists of all licenced landfill within the county.
• **Pollutant Release & Transfer Register (PRTR)**	• Each licenced landfill produces an annual report. The annual report contains a Pollutant Release and Transfer Register (PRTR), where its emissions can be found.
• **CSO** Source: https://data.cso.ie/	• As landfills may serve populations outside of the county they are located within, the total emissions of the landfill may not represent the county. To account for this, emissions per capita are calculated. • The 2016 CSO population was used in this calculation.

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4.10 Tier 2 'Bottom-Up' Assessment: Data sources, assumptions & limitations

Municipal Sector:

Data Source	Assumption & Limitation
• **SEAI M&R System** Source: https://www.seai.ie/business-and-public-sector/public-sector/monitoring-and-reporting/	• The SEAI M&R System was used to extract the annual electricity and gas consumption of the local authority, where public sector bodies are required to report on their annual energy performance. • The system is updated manually and may contain human errors.
• **SEAI Conversion Factors** Source: https://www.seai.ie/publications/Energy-in-Ireland-2019-.pdf	• The SEAI conversion factors represent some of the most robust carbon benchmarks for fuel types in Ireland and would be considered a strong proxy for carbon calculations in the county.

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4.11 Tier 2 'Bottom-Up' Assessment: Residential Sector supporting data

Residential Sector: Energy & Carbon Emissions

Weighted average of CSO data of dwelling types in Wicklow County Council, grouped by dwelling type and construction period.

	Number						
Dwelling type	**All years**	**Before 1919**	**1919 to 1970**	**1971 to 1990**	**1991 to 2000**	**2001 to 2010**	**2011 to 2016**
All households	48,999	4,682	8,680	12,874	7,264	11,812	1,069
Detached	22,360	2,710	3,535	5,702	4,316	4,690	522
Semi-detached	14,488	772	3,006	4,785	1,935	3,013	258
Terraced	7,866	908	1,872	1,997	540	1,952	123
Apartment	4,284	291	267	391	472	2,156	166

Calculation of average energy consumption for housing units in Wicklow County Council, grouped by dwelling type and construction period

	kWh/year						
Dwelling type	**All years**	**Before 1919**	**1919 to 1970**	**1971 to 1990**	**1991 to 2000**	**2001 to 2010**	**2011 to 2016**
All households	21,937	39,759	30,142	22,517	19,816	17,865	11,615
Detached	33,451	53,020	41,072	31,909	28,099	26,600	14,978
Semi-detached	21,207	39,961	28,385	21,009	17,166	15,388	8,253
Terraced	21,081	46,904	30,965	23,257	22,436	18,578	-
Apartment	12,009	19,151	20,147	13,892	11,563	10,895	-

SEAI carbon emission conversion factors

Energy source	gCO_2/kWh
Coal	340.6
Peat	355.9
Residual Oil	273.6
LPG	229.3
Natural Gas	204.7
Renewables	0
Electricity	375.2
Wood	15.1

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4.12 Tier 2 'Bottom-Up' Assessment: Residential Sector supporting data

Residential Sector: Social Housing: Energy & Carbon Emissions

Weighted average of social housing units in Wicklow County Council, grouped by dwelling type and construction period. Note that the total number of social housing stock has been provided by Wicklow County Council

	Number						
Dwelling type	**All years**	**Before 1919**	**1919 to 1970**	**1971 to 1990**	**1991 to 2000**	**2001 to 2010**	**2011 to 2016**
All households	5,231	500	927	1,374	461	1,261	114
Detached	2,387	289	377	609	207	501	56
Semi-detached	1,547	82	321	511	58	322	28
Terraced	840	97	200	213	50	208	13
Apartment	457	31	29	42	461	230	18

Calculation of average energy consumption for social housing units in Wicklow County Council, grouped by dwelling type and construction period

	kWh/year						
Dwelling type	**All years**	**Before 1919**	**1919 to 1970**	**1971 to 1990**	**1991 to 2000**	**2001 to 2010**	**2011 to 2016**
All households	16,451	25,043	21,743	16,609	14,611	14,457	-
Detached	21,539	25,815	28,336	22,794	21,610	17,823	
Semi-detached	14,534	25,815	19,896	15,389	13,251	14,211	-
Terraced	15,826	23,500	23,500	17,498	13,188	14,901	-
Apartment	13,903	-	15,240	10,754	10,396	10,895	-

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4.13 Tier 2 'Bottom-Up' Assessment: Commercial & Industrial Sector supporting data

Commercial & Industrial Sector: Energy & Carbon Emissions

Breakdown of commercial building types in the county

Building type	Floor Area (m^2)
Fuel/ Depot	24,638,625
Health	13,215
Hospitality	120,909
Industrial Uses	1,339,822
Leisure	32,651,272
Minerals	4,501
Office	141,680
Retail (Shops)	211,541
Retail (Warehouse)	63,447
Total	**59,185,013**

Carbon emissions factors

Energy source	gCO_2/kWh
Oil	274
Coal	341
Natural Gas	205
Electricity	375
Renewables	0

Energy benchmarks used for commercial buildings types in the county

Building type	Typical practice fossil fuels (kWh/m^2)	Typical practice electricity (kWh/m^2)
Retail	169	287
Office	151	85
Restaurant/ public house	1250	730
Hotel	400	140
Warehouses	169	67
Workshops/ maintenance depot	311	39
Industrial process building	96	0
Hospitals and primary health care	267	113
Community/ day centre	139	47
Nursing residential homes and hostels	337	83
Schools and colleges	111	41
Sports facilities	598	152
Other	333	162

National Commercial and Public Sector energy consumption breakdown

Fuel split in commercial sector	Commercial/Public Services (Units: ktoe)	%	% fossil fuel only
Coal	0.52	0.03%	0.1%
Oil	241	14%	40%
Natural Gas	329	20%	54%
Renewables	39	2%	7%
Electricity	1,079	64%	-
Total	**1,688**	**100%**	**100%**

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4.14 Tier 2 'Bottom-Up' Assessment: Agriculture Sector supporting data

Agriculture Sector: Energy & Carbon Emissions

No. of total livestock in Wicklow, grouped by type

Type of Livestock	Number of livestock on farms	Number of farms with livestock
Total cattle	131,382	1,475
Dairy cows	26,601	253
Other cows	21,086	1,085
Other cattle	83,695	1,465
Total sheep	323,367	1,330
Ewes	164,206	1,267
Other sheep	159,161	1,326
Total pigs	15,957	44
Boars	23	10
Female breeding pigs	226	16
Other pigs: 20kg and over	15,345	34
Other pigs: under 20kg	363	12
Total poultry	36,944	173
Laying stock	11,234	160

Carbon emissions factors

Energy source	gCO_2/kWh
Jet Kerosene	257
Gas / Diesel Oil	264
Electricity	375

No. of farms in Wicklow, grouped by type

Farm Type	Number
All farms	13,704
Specialist tillage	745
Specialist dairying	3,801
Specialist beef production	5,857
Specialist sheep	826
Mixed grazing livestock	530
Mixed crops and livestock	202
Mixed field crops	1,509
Other	234

No. of different crop types in Wicklow

Type of Crop	Area under Crops (hectares Ha)	No. of Farms with Crops
Area farmed (AAU)	103225.1	2456
Commonage	26860.2	-
Pasture	53511	2051
Hay	3937.3	519
Grass silage	22749.7	1396
Total crops fruit and horticulture	3235.6	601
Total cereals	10726.5	349
Rough grazing in use	9065.5	622
All grassland	89263	2417

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4.15 Tier 2 'Bottom-Up' Assessment: Agriculture Sector supporting data

Agriculture Sector: Energy & Carbon Emissions

Energy benchmarks used for agricultural livestock types in the county

Livestock	Unit	Electricity	Heat	Mobile Machinery	Total	Country	Source	Title	Year
Dairy Cows	kWh/livestock/yr	325	0	550	875	UK	DEFRA	Renewable energy and energy efficiency options for UK dairy farms	2010
Beef Cows		0	0	453	453			Direct energy use in agriculture: opportunities for reducing fossil fuel inputs	2007
Sheep		0	0	19	19				
Poultry		1	0	0	1	IRE	Teagasc	Energy use in agriculture	2011
Pigs		5	20	1	27				

Energy benchmarks used for agricultural cropland produce types in the county

Cropland	Unit	Electricity	Heat	Mobile Machinery	Total	Country	Source	Title	Year
Wheat	kWh/livestock/yr	239	203	1,078	1,520	UK	DEFRA	Direct energy use in agriculture: opportunities for reducing fossil fuel inputs	2007
Barley		173	146	942	1,261				
Oats		173	150	1,078	1,401				
Other Cereals		118	100	1,078	1,296				
Potatoes		1,618	85	3,230	4,933				

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4.16 Tier 2 'Bottom-Up' Assessment: Agriculture Sector supporting data

Agriculture Sector: Energy & Carbon Emissions

Energy benchmarks used for field vegetable produce types in the county

Vegetable	Unit	Electricity	Heat	Mobile Machinery	Total	Country	Source	Title	Year
Leafy Salads	kWh/livestock/yr	11,538	0	1,100	12,638	UK	DEFRA	Direct energy use in agriculture: opportunities for reducing fossil fuel inputs	2007
Onions		3,846	3,000	1,600	8,446				
Other Veg		0	0	1600	1600				
Fruit		0	0	300	300				

Methane benchmarks for livestock types in the county

Type of Livestock	Unit	Methane
Beef cattle	gCH4/livestock/day	230
Dairy cow		330
Lamb		8.2
Hogget		14.5
Ewe		20.5

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4.17 Tier 2 'Bottom-Up' Assessment: LULUCF Sector supporting data

LULUCF Sector: Land Use Types

Type of Land Use (as per Corine 2018)	Area (hectares Ha)	% of Wicklow County Council area
Pastures	86768	42.8%
Coniferous forest	22177	10.9%
Moors and heathland	19128	9.4%
Peat bogs	18087	8.9%
Non-irrigated arable land	11109	5.5%
Land principally occupied by agriculture, with significant areas of natural vegetation	10737	5.3%
Transitional woodland-shrub	9593	4.7%
Mixed forest	6202	3.1%
Discontinuous urban fabric	3958	2.0%
Broad-leaved forest	3622	1.8%
Natural grasslands	3087	1.5%
Water bodies	2435	1.2%
Sport and leisure facilities	1630	0.8%
Complex cultivation patterns	1101	0.5%
Inland marshes	833	0.4%
Mineral extraction sites	416	0.2%
Road and rail networks and associated land	348	0.2%
Sparsely vegetated areas	291	0.1%
Salt marshes	221	0.1%
Beaches, dunes, sands	211	0.1%
Industrial or commercial units	152	0.1%
Burnt areas	113	0.1%
Sea and ocean	82	0.0%
Continuous urban fabric	71	0.0%
Port areas	50	0.0%
Dump sites	43	0.0%
Coastal lagoons	39	0.0%
Construction sites	32	0.0%
Total	202538	100.0%

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